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JUNE 24, 1983

# IRON AGE

THE MAGAZINE FOR METALWORKING MANAGEMENT

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## IGES:

## BRIDGING THE ISLANDS OF GRAPHICS AUTOMATION

Plus:

WHAT'S SO TOUGH ABOUT PUBLIC SPEAKING?

AUTO ENERGY: PART TWO OF A TWO-PART SERIES

FARM EQUIPMENT MAKERS STILL IN TROUBLE

VOL. 226, NO. 18

# IRON AGE

JUNE 24, 1983

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## LETTERS

compete on equal terms in quality, in price, and in service.

The answer lies in exactly what's going on in the automobile and steel industries at this very moment. Unions are negotiating wage concessions in order to allow manufactures of American goods to get their wage costs in line so they can compete in our own domestic markets. Once we start competing in our own domestic markets, we'll be on the road back to the time when "the U.S. was riding high and dominating world trade."—Henry W. Brandt, Ravenswood Works, Kaiser Aluminum & Chemical Corp., Ravenswood, W. Va.

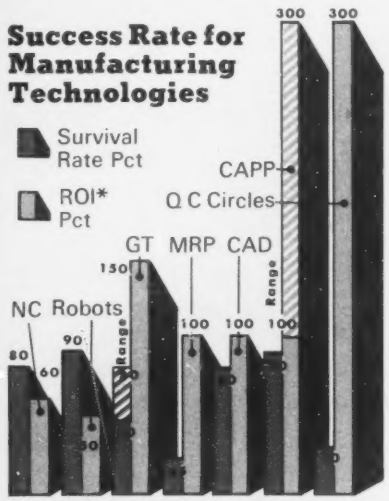
### Basic industries

Your "Basic industries" editorials seem to be so on target, "Why we need basic industries more than ever," (*IA*, Apr. 13, '83, p. 7) and "Why high technology needs basic industries" (Apr. 22, '83, p. 7).

It's scary to think that those with authority, in industry and in government, are acting or reacting or not acting for some reason other than that which is good for *all* concerned.—Walter Hutt, president, Communigraphics Inc., Woodbury, N.Y.

### Correction

In the article "Group Technology: revitalized by computer power," (*IA*, May 20, 1983) the chart that appeared on p. 70 is in error. The colors indicating 'survival rate pct' and 'ROI pct' were reversed. A corrected chart is shown below.

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Unsigned letters are not published, but names are withheld on request.


# ANNOUNCING WAUKESHA'S NEW INVESTMENT CASTING PLANT

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**For Information, Circle 109**

# FARM MACHINERY STILL HAS A LONG ROW TO HOE

**With forecasts calling for a gradual sales gain, farm machinery makers should have few problems meeting the market's demands.**

BY KEITH W. BENNETT

A fast recovery in 1978, when farm machine companies were still laying off workers in the first calendar quarter of that year, brought dealer shortages of farm machines by May and June. The subsequent boom carried farm equipment sales upward for 18 months.

Since then farm machine companies have been laying off workers, closing plants, and selling off manufacturing equipment and product lines as they struggle to survive.

Two of the biggest farm machine builders have halved their plant total. There have been other capacity losses among smaller producers. But much of the loss is in fabricating and open assembly space. It can be boosted quickly in a recovery by leasing outside plant space.

In the 1973 recovery, a 25 pct sales gain exhausted farm equipment inventories in about three months. In 1978, a 30 pct sales recovery cleaned out stocks in about the same length of time.

In its main plants, the farm equipment industry has hung on. Its machining capacity is strong and has been since 1979. Deere is most frequently mentioned, but all farm machine producers had good capital programs in 1979 and 1980. Some new equipment was still coming on in 1981. As one manufacturing official at International Harvester pointed out, eight DNC machine tools in one line replaced 77 older machine tools and with higher output.

Some capacity has been soaked up by new products. Light industrial equipment comes from many of the same plants, and this has improved with the housing market. Some short liner capacity has been reduced as they took on work farmed out from the bigger farm machine companies. In one past downturn big companies farmed out so much work to short liners that some short liners grew in size through the slump.

The farm machine plants, considering their problems, have held their plant capacity surprisingly well. The in-

## Farm Equipment—Waiting for the Recovery to Sprout

| | Farm, Gross Income, Billions of Dollars | Retail Tractor Sales, Units | Employment in Farm Equipment Plants | Sales, Billions of Dollars |
|---|---|---|---|---|
| **1983** | 145.0* | 84,000* | 97,600* | 13.0* |
| **1982** | 142.0* | 77,000 | 93,000** | 12.2 |
| **1981** | 143.0* | 103,000 | 135,300 | 15.8 |
| **1980** | 137.7 | 119,331 | 147,400 | 15.1 |
| **1979** | 133.2 | 138,990 | 158,900 | 15.9 |
| **1978** | 115.9 | 139,607 | 145,100 | 11.9 |
| **1977** | 98.1 | 130,912 | 149,500 | 11.9 |
| **1976** | 95.1 | 153,189 | 162,100 | 10.5 |
| **1975** | 89.0 | 161,145 | 160,800 | 9.9 |
| **1974** | 92.9 | 173,799 | 169,200 | 8.6 |
| **1973** | 89.6 | 196,994 | 153,600 | 6.9 |
| **1972** | 65.0 | 156,762 | 135,000 | 6.9 |
| **1971** | 56.0 | 131,523 | n/a | 5.5 |

*Estimates
**Year-end figure, not annual average

dustry's current production capacity is more productive now than it was in the 1979 boom. If farm equipment gets the gradual gains it has forecast for 1983, it'll have no problem and plenty of reserve capacity.

Unfortunately, the history of the farm equipment industry is full of sudden spurts. There never has been enough capacity and there isn't now. The plants, with castings a particular bottleneck, quickly overload and deliveries to the dealers get stretched out. And if the plants can't keep up with the demand, there are some brand new foreign tractor builders (Japan and Russia) who would jump at the opportunity to replace those dealer inventories.

At this point, the biggest builder (Deere & Co.—$4.7 billion in 1982 sales) has held intact. It has as much productive capacity now as it did at any time in its history. Nevertheless, it has cut back from $300 million in new investment in its farm machinery plants during 1980, to $130 million last year, and $100 million in fiscal 1983.

Its two biggest competitors, International Harvester Corp. and Massey-Ferguson Ltd., were in tougher cash positions and suffered considerably in the cutbacks. Massey-Ferguson closed its Des Moines, Iowa, plant in 1981. Since then, it has cut its three-plant complex at Detroit to a service group. It also reduced assembly space at its big plant in Brantford, Ont., but concentrated tools there to build heavy tractors and much of its production of combines.

It closed 15 plants. It still maintains worldwide operations in the United Kingdom (tractors and engines); France (tractors, combines and balers); West Germany (components, fluid power parts and combine transmissions); Italy (assembly and gears), and Australia (combines and special machines).

This leaves intact its key machining and casting facilities (two foundries in Canada). It added some equipment for producing new product lines in its engine plants and tractor plants. Like most producers, however, the bulk of capital seems to have gone to new model design and tooling. It reopened its combine line in January.

Massey-Ferguson believes it picked up a 1 pct market share gain in tractors and a 2 pct gain in combines. It also sold off a tractor plant in Brazil and a U.K. plant, and closed a foundry in West Germany, in addition to the shutdowns in Detroit. That leaves about 18 plants (not including engine plants) for the company, which had $2 billion sales in depressed 1982. Its capital input peaked early in 1976 at $175 million. It has been running about $45 million per year the past three years.

International Harvester came into its financial pinch later than Massey-Ferguson, but hit it as the market for farm machines was making its worst plunge. Of 14 farm machine plants, International Harvester has plans to close seven.

The core plants remaining are the tractor plant in Rock Island, Ill. (tractor and truck engines), plants in Hamilton, Ont. (implements). Overseas, it has plants in Germany, U.K. and France for equipment and tractor engines. Indianapolis is mainly a supplier to the truck group, but can feed castings and machined components to the farm equipment group. It is one of two foundry bases for International Harvester. Waukesha is a modernized nodular iron castings producer. All of these seem to be on the books for the future.

**Ford Tractor plants are capable of handling an upswing merely by adding shifts.**

International Harvester was expected to sell its Louisville, Ky., plant in July at a reported price of $26 million. This deal, however, has been cancelled.

This plant has been an important manufacturing base for International Harvester, since it includes a foundry, a forge shop and a major machining line (valued earlier at about $12 million) that made axles and transmissions. IH moved the machining line to its plant at Rock Island, adjacent to its Farmall tractor plant, which is scheduled to begin tractor production in August.

International Harvester's capital input peaked in 1980 then slipped to $108 million last year. Farm machinery sales are 43 pct of total sales. The capital input went into both truck and farm machinery plants, so farm equipment would only receive part of the outlays, but new equipment was still coming on stream through 1981.

Allis-Chalmers Mfg. Co. has closed its foundry in Milwaukee. This was rated at over 2,000 tons per month and was a modern foundry, rebuilt in the wave of farm equipment plant modernizations that followed the cash flow surge of 1978-79. It has been closed because of high labor costs.

Allis-Chalmers has four main plants. At West Allis, it builds tractors and has restarted production in this plant. It builds combines at Independence, Mo., engines at Harvey, Ill., and has said earlier it would sell an implement plant (discs and plows) in LaPorte, La. This hasn't been closed, but might be sold or closed by the end of 1983.

Ford Tractor Operations is a short-line producer of tractors, but farms out work in other implements including combines. This is a manufacturing resource that's still fully intact, with a tractor assembly plant at Romeo, Mich.; a transmission and axles tractor assembly facility in Antwerp, Belgium; an engine and hydraulics plant at Basildon, U.K.; and an assembly plant with engine production in Brazil. The Brazilian facility has its own foundry, though the castings output is consumed in the local market.

The Ford tractor plants are capable of handling an upswing merely by adding shifts to the plants.

J. I. Case, part of Tenneco, is an important tractor producer with five plants and two foundries and its main base of operations at Racine, Wisc. Case Vice President Robert Riebau points out that this capacity is also intact, ready for an upturn.

Case added a $6 million valve fabricating line at its Rock Island, Ill., plant. That line began production last November. This plant also produces four-cylinder engines. Other company sources note that, Case did a better job on inventory reductions than it had expected and that it has raised its sales targets for 1983.

Steiger Tractor, another short line tractor builder and a specialist in big, top-of-the-line machines, put in some new machine tools last year including a $500,000-plus Sundstrand machining center and a CNC lathe, to handle the new tractor designs.

White Farm Equipment, with three plants and its own 400 ton-per-day gray iron foundry, is a producer of combines. It also builds tractors as well as tillage and planting machines. Robert Fuller, chief operating officer of this group, says that it has weathered the storm and kept its machining and foundry capacity intact.

Beyond these companies is another capacity reserve of some 1,100 smaller producers, the "short liners," who produce a few different lines.

Their numbers were reduced by business failures, but surprisingly, the Farm Equipment Manufacturers Association finds the number of new members again rising.

People buy up companies that have either failed or been spun off. So, that capacity is holding better than expected. By March, a number of these plants were making slight increases in their production schedules. □

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# IGES: BRIDGING THE ISLANDS OF GRAPHIC FORMATION

**IGES extends the potential of CAD/CAM systems, building blocks of the automated factory, by letting them talk with other systems.**

BY ROBERT E. HARVEY

Hotel rooms set aside for the conference had filled up weeks in advance. And as the two-day meeting got underway, speakers looked out on a standing-room only crowd.

"Heck, who ever thought 300 people would turn up at a conference about something no one even knows how to pronounce," marvelled one attendee. "So far I have heard 'I guess,' 'I jest,' 'I gees,' and 'eye juice' and I've only been here ten minutes."

At recent seminars and conferences (like the one mentioned above sponsored by Management Roundtable Inc., Chestnut Hill, Mass., last month in Washington, D.C.) industry officials having been taking a crash course in IGES (Initial Graphics Exchange Specification).

High interest in IGES is the direct result of the explosion of CAD/CAM (Computer-Aided Design/Computer-Aided Manufacturing) systems. Some 10,000 have been sold in recent years. These systems have done much to improve design and manufacturing productivity. But as the number of systems grew, users began experiencing the notorious Tower of Babel Syndrome. This syndrome can be summed up by the axiom: The greater the proliferation of CAD/CAM systems, the harder it becomes to get them to talk among themselves.

To unshackle the potential of CAD/CAM and make it more than simply an island of automation, its data has to be made portable, portable across different hardware and portable across different software packages. IGES was developed to address this need.

Translating data from one system to another was going on well before the appearance of IGES. Custom translators have been developed which let incompatible systems talk to each other. However, constructing all the translators needed to link all the systems that want to be on speaking terms with each other can be a monumental task, for these specialized exchange programs only know about the two CAD/CAM systems for which they were written. Any change in a vendor's systems means changing the translator.

IGES was developed to reduce communications problems between systems. Its creators reasoned that if a standard format, a common language independent of all CAD/CAM systems, could be formulated, translations could be simplified.

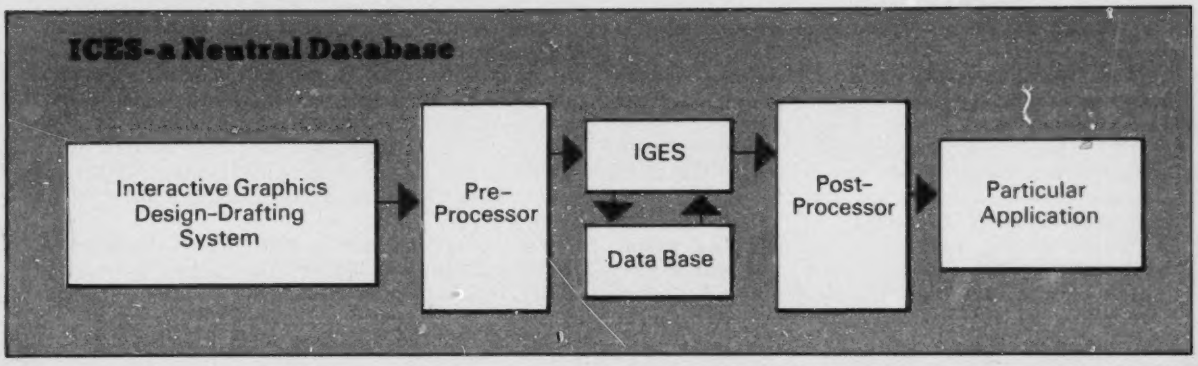
Only one translator, a pre-processor, would be needed to translate data from any one system into standard data. And only another translator, a post-processor, would be needed to convert the standard data back into the language of a particular system. With a common second language available in addition to system's own propriatory language, islands of automation will become more accessible.

"Different islands of automation are addressed by different vendors," explains Joel N. Orr of Orr Associates, a consultant in Danbury, Conn. "Also they are addressed by different parts of your manufacturing organization. Many of these islands depend on getting data in a certain format and unless we have a broad-based, a broad-band format through which we can pass the data from one part of the process to another, we are not going to be able to implement the automated factory."

A company can go out and buy a robot, an NC machine, a network, a system or any other piece of equipment, but its factory will continue to limp along until these systems are linked together properly.

"You are going to have to establish a common language among all these different parts," says Dr. Orr. "I would like to suggest that the current IGES effort is heading us in this direction."

Recognizing that the full potential of CAD/CAM was being stymied by difficulties in communicating between different systems, representatives from



government and industry got together in 1979 to initiate a program to overcome this obstacle. Initial funding for the project came from NASA and the Armed Services through the Air Force's Integrated Computer-Aided Manufacturing (ICAM) program and was used primarily by a group of CAD/CAM suppliers and industrial users.

Early work on developing a data exchange standard was done by the National Bureau of Standards (NBS), the General Electric Co., and the Boeing Co., with the NBS coordinating the overall effort. The American National Standards Institute recognized IGES in 1980 and included it as part of a proposed standard for the digital representation for communication of product definition data. Approval of the standard was issued in September 1981.

"The IGES program has focused the efforts of 52 (now 56) companies on the development and documentation of a means of graphic database exchange among present day CAD/CAM systems," says Bradford M. Smith, head of the Manufacturing Systems Group, Automated Production Technology Div., NBS.

As companies become increasingly automated, many firms find themselves with a large number of design systems, often from a variety of manufacturers. And each CAD manufacturer has its own way of storing geometric models and related information. Firms, especially those with a large number of incompatible automated design systems, have begun to look to the neutral format of IGES as a way of moving that design geometry beyond a particular CAD system.

"You have to integrate these systems into a corporate network," says Mr. Smith. "You have to be able to talk to your subcontractor, to your customers. IGES allows you to do this by providing a public interface between your system and any foreign process, as we call it. That foreign process could be a design routine for a family of parts, an analysis routine for a product; it could be special purpose software that you have developed. It could be another turnkey system or your manufacturing process. The types of foreign processes are almost limitless."

The reason that many companies own a lot of non-communicative systems, according to a report by Alan M. Christman, general manager, manufacturing industry marketing, Control Data Corp., Bloomington, Minn., is because, "systems implementations are generally single function or departmental level solutions. In theory, the application possibilities of the systems are numerous. In reality, we see single turnkey systems acquired specifically for a single function. For example, 80 pct of CAD systems are simply used for drafting."

Mr. Christman explains that this preoccupation with purchasing for a single function has resulted in a proliferation of data bases and systems, "all of them from different vendors and often not accessible to users of other systems. The result is an expensive, time-wasting, less efficient effort that erodes the very productivity that the system promotes," he says.

**Firms that Are, or Plan to Be, Compatible with IGES**

| Company | Offers IGES Compatibility | Plans to Offer It | Processors Already Delivered |
|---|---|---|---|
| Applicon | ■ | | 2 |
| Auto-trol | | ■ | |
| Bausch & Lomb | ■ | | |
| AM Bruning | | ■ | |
| CADAM | | ■ | |
| CADLINC | ■ | | |
| Calcomp | | ■ | |
| Calma | ■ | | 12 |
| CAMAX | | ■ | |
| CASCADE | | ■ | |
| Compeda | | ■ | |
| Computervision | ■ | | 50-100 |
| Control Data | ■ | | 40 |
| Data Technology | | ■ | |
| Decision Graphics | ■ | | |
| Engineering Systems | | ■ | |
| Gerber Systems | ■ | | 8 |
| GRAFCON | ■ | | |
| Graphics Technology | ■ | | |
| Holguin Assoc. | | ■ | |
| Honeywell | ■ | | |
| Information Displays | ■ | | |
| IBM | ■ | | |
| Interactive Systems | ■ | | |
| Intergraph | ■ | | 25 |
| Keuffel & Esser | | ■ | |
| MAGI | | ■ | |
| Manu. & Consult. Svcs | ■ | | 120 |
| Marc Software | ■ | | |
| MATRA DATAVISION | ■ | | 1 |
| Mcauto Unigraphics | ■ | | |
| Mentor Graphics | | ■ | |
| Prime | ■ | | |
| Project Software | | ■ | |
| Racal-Redec | | ■ | |
| Summagraphics | | ■ | |
| Telesis | | ■ | |
| Systemhouse | | ■ | |
| T & W Systems | | ■ | |
| Tektronix | | ■ | |
| Vector Automation | | ■ | |

Source: Machover Association Corp. and NBS

A number of companies, if they could standardize their equipment around a single vendor, would not have to concern themselves with IGES. For other firms, however, relying solely on one vendor and not considering IGES would be a big mistake.

For one thing, no turnkey CAD/CAM can meet all automation needs for everyone. For another, by going with only one vendor, a company has reduced its options and flexiblity.

"Any company that thinks that it can say by decree that it will buy only product A for a graphic system is really not understanding the problem," says Mr. Smith, "because as soon as you standardize on a product, someone will come along with a far better product and you are going to find yourself rapidly becoming obsolete. Ideally, what you would like to do is develop an integration philosophy that will allow your firm to use the best available technology and, when that becomes obsolete in six months or six years, lift the out-of-date module out of the system and plop into that space a new module that will fill that function much better.

"This exchange cannot be done unless a firm has some kind of exchange standard. Without this standard the expense of the software engineering needed to replace the system would probably make updating far too expensive to consider."

Besides extending a company's flexibility and its ability to integrate operations, IGES holds the promise of solving the problem of long-term data storage or archiving.

"Archival data is data which you traditionally have been storing on engineering drawings in a vault. This is the life blood of many of your companies," suggests Mr. Smith, "and in many cases it is required by law to maintain the record of the design and manufacture of certain component parts for as long as the product is useful. If the record exists on computer-readable format, it would certainly be to your advantage that it be kept in its computer-readable format for that lifetime."

If computer systems are changed or upgraded, there is danger that old data would become difficult to retrieve. With IGES, however, old graphics could be converted into the neutral IGES format and then picked up by whatever system needs the information.

While IGES has a number of potential benefits, it is not the panacea that some people take it for. Because IGES is new and still relatively unknown, a number of myths have grown up about its abilities. IGES is not a cure-all, it is but a first step towards graphics integration.

According to Dr. Orr, one myth is that management thinks that with IGES, "the electrical guys can get the CAD system they want, and the mechanical guys can get their system, and facilities people can get their system, and, in the end, they all will be able to talk to each other."

Another myth goes something like this: "Now we won't have to worry about communicating with vendors or suppliers, because no matter what system they have, we can work it out through IGES."

Dr. Orr's third myth: "We can archive our interactive computer graphics

files and know that any time in the future we will be able to read them into whatever format we are using."

"The truth is that a joke in French, if translated from that language into another language and from that language into German will seldom make Germans laugh at the punch line. Now this has nothing to do with the intermediate language, but it has to do with the differences between French and German. There are things you can say in French that you can't say in German and vice-versa. There are things you can say in Calma that you can't say in Computervision. The best thing IGES or any other standard can do is be transparent, it cannot improve on the data that is going through."

"My message to users is to do careful evaluation before using IGES," comments Ralph J. Mayer, manager, database management, Computervision Corp., Bedford, Mass. "Do not accept statements like 'we support IGES' or even 'we support the following IGES entities'. There are always exceptions and limitations."

Despite extensive documentation by vendors such as Computervision as to what IGES entities they support and translate, "I would not want to guarantee a successful translation between Computervision and another vendor," reports Mr. Mayer.

If a translation is not working properly, "the fault lies with the users who are simply taking a very complex tool and saying, 'I'll plug it in and I expect productivity to come out the other way,' " says Dr. Orr.

IGES, although not yet in widespread use, is gaining in popularity. Several hundred companies are working with IGES, however, only a few of these firms are using it in a production environment. Much work still must be done on improving the translators.

Many CAD/CAM vendors are committed to translator development. In addition, a number of firms that have developed their own in-house CAD/CAM software packages, are writing translators. These firms include General Motors, Ford, General Electric, Bendix, Boeing, Deere, Lockheed, Martin Marietta, SDRC, and Westinghouse.

As IGES grows, it evolves. Feedback from the first version has gone into developing IGES Version 2.0, which is a refinement and extension of Version 1.0. The most notable advancements of the newer version over Version 1.0 are the addition of finite element modeling data and electronics printed wiring board product data. Previously there was no method of handling data from these areas.

Version 2.0 also contains details for an optional or alternate binary format representation which increases processing speed and reduces file size. Unwieldy file size and slow speeds were two complaints about Version 1.0.

Simply stated, IGES is a data format used to represent the geometric and non-geometric information that is stored in CAD/CAM systems, arranged in a particular file structure.

But IGES is not the only language that has been developed to act as an interface between dissimilar systems. Intergraph Corp., for one, has constructed its Standard Interchange Format (SIF) which, like IGES, is a language for the exchange of graphics and non-graphic information.

According to Patricia Brown, ISIF manager, Intergraph Corp., SIF has several advantages over IGES. "It is not a fixed format structure, but is free-form, using keywords to identify specific data and parameters. Its syntax is generic and applicable to graphic systems in general, and its sequential file structure, combined with its keyword capability, eliminates the need for pointers and is consequently a more direct and coherent presentation of data."

By using active parameters rather than passive ones, Ms. Brown claims that SIF files are smaller than their IGES counterparts.

Vought Corp., with its Standard Product Data Exchange File format (SDF) is another firm that has developed a standard file format which it finds superior to IGES.

Despite any advantages that formats such as SIF and SDF may have, IGES probably will become the industry standard. "The momentum for IGES right now is just too strong," says one conference participant. "Plus, IGES has been a group effort rather than the work of just one firm."

IGES is being challenged not only by developers of other standards, but also by companies that offer expertise in the direct conversion of information from one data base to another. Direct conversion eliminates the need of a neutral format.

John Greene of Octal Inc., Mountain View, Calif., argues that "IGES and other intermediate schemes are premature, that IGES cannot be all things to all people, and that viable alternatives exist."

According to Mr. Greene, IGES is only a recent development and has several drawbacks which make direct database conversion preferable in many cases.

"Direct database translation has many advantages over an intermediate format. These include: lower development cost, more accurate and complete data translation, no cumbersome intermediate files, faster conversion runtime and single-source software."

Mr. Greene compares IGES to Esperanto which was supposed to be a neutral universal language for mankind. Esperanto faded into oblivion as an impractical anachronism. He believes that if IGES "is not to become the Esperanto of the computer world, some narrowing down of its scope must take place."

In the past, computers were able to talk to each other after programmers developed expensive, time-consuming, custom-written, in-house computer programs. Today, other options such as direct conversion and conversion through a neutral format like IGES are available. IGES is still in its infancy, but holds the promise of being a major step forward in one of industry's biggest challenges: linking the islands of factory automation. □

## Metalworking's Manufacturing System: 41

Other articles in this series in 1982:

**Speech Technology: The Voice of Tomorrow's Factories?** May 21, pp. 92-97

**The Emerging Worldwide NC Race,** June 25, pp. 59-64

**Are Superminis Chalienging The Mainframe Computers,** July 23, pp. 57-65

**Now, It Can Be Tested on The Terminal,** Aug. 20, pp. 109-112

**Is It Time for a New Approach to NC Programming?,** Sept. 24, pp. 83-89

**Are Factory Systems the Path to Productivity?,** Oct. 22, pp. 41-48

**Will Turnkey CAD/CAM Systems Remain Viable?,** Nov. 19, pp. 49-56

**Guidelines for Buying a Personal Computer,** Dec. 15, pp. 49-53

In 1983:

**Air Force ICAM Project Paves the Way for the Factory of the Future,** Jan. 21, pp. 48-55

**Factory of the Future: The Love/Hate Response to Automation,** Feb. 25, pp. 45-56.

**PC's Move Into Motion Control,** Mar. 25, pp. 65-70.

**Sensors Give Robots an Extra Touch,** Apr. 22, pp. 49-57.

**Group Technology: Revitalized by Computer Power,** May 20, pp. 61-72.

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# AUTO ENERGY: MEETING THE NEED IN THE FUTURE

## Methanol holds tremendous promise and it's made from U.S. coal.

*Shifts in fuel prices always hit automakers hard. By 2000 they'll likely need new engines to use different fuels. In part two of a two-part series,* Iron Age *examines: Can American auto and oil companies and government reduce U.S. dependence on imported oil?*

BY BRYAN H. BERRY

Five years from today, all new cars built in the U.S. could use methanol made from U.S. coal. All that's required is for the U.S. government, auto industry, and energy industry to agree to do it.

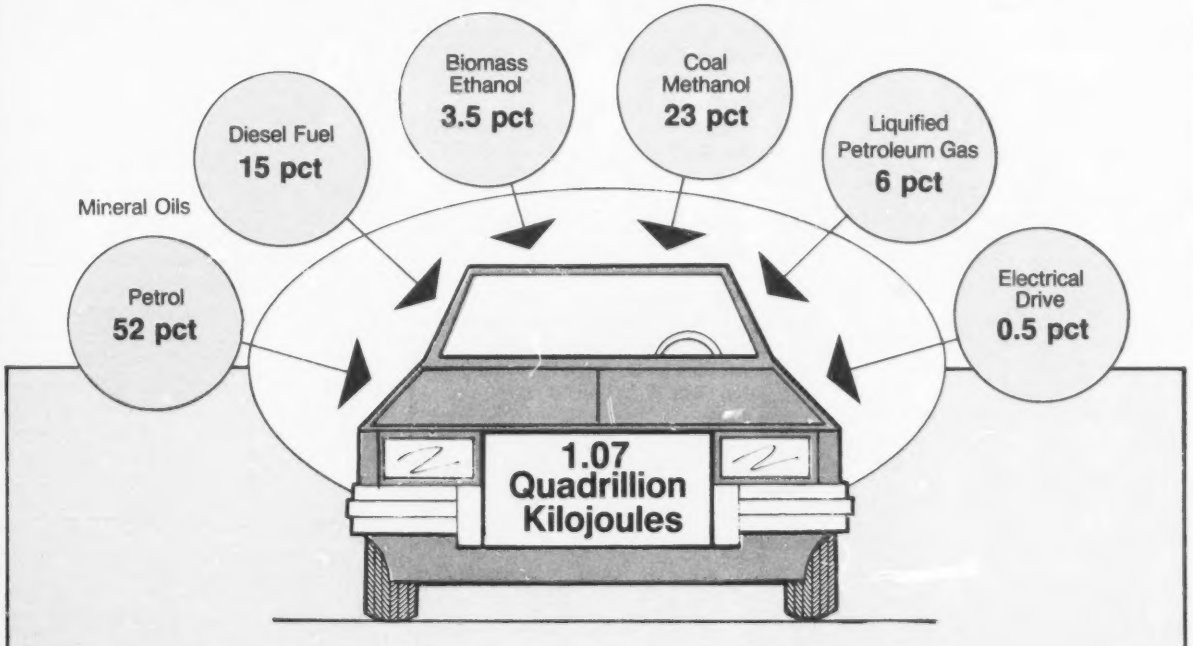
Already General Motors and Ford are working with major oil companies. Ford has projects with Sohio, Conoco, and Amoco. GM and Gulf of Canada recently completed a joint study of how to process diesel fuel from Canadian tar sands.

Can giants like the U.S. government, Exxon, and General Motors cooperate to free U.S. cars from dependence on foreign oil? Could U.S. metal producers supply the materials to build huge methanol plants? Could U.S. metalworking companies supply the parts needed in methanol-powered engines?

"The most difficult and intriguing question of all," says Dr. E. E. David, Jr., president, Exxon Research and Engineering Co., "is how to make the transition to methanol-powered cars. It looks like one of those insoluble chicken-and-egg problems.

"How can the auto manufacturer risk mass-producing methanol engines unless the fuel companies stand ready to market methanol? And how can a fuel manufacturer produce methanol unless the auto companies stand ready to produce the cars? Remember that one 50,000-barrel-per-day methanol plant would require a two-million-car market

### Possible Sources of Energy for Vehicles in Year 2000




Source: Volkswagen R&D.
These projections are for West Germany.

to absorb its output."

The United States has 20 times more energy stored in coal than the Middle East has in oil. Estimated U.S. coal reserves are equivalent to 11,751 billion barrels of oil.

"In principle," says Glenn R. Brown, senior vice president, technology and planning, Standard Oil of Ohio (Sohio), "enough methanol or synthetic gasoline could be made from U.S. coal to power every car in the country. U.S. coal reserves are vast and plant siting options diverse. Coal-based synthetic fuel plants could be scattered widely through the country."

The U.S. also has twice as much energy stored in shale oil as the Middle East has in oil. Estimated U.S. shale-oil reserves are equivalent to 1,935 billion barrels of oil.

The gasoline refined from shale oil can be used in today's cars. This fall Union Oil will begin producing 10,000 b/d of shale oil for the U.S. Air Force.

Short-term, some automakers favor development of shale oil. They wouldn't have to change their engines.

Long term, however, methanol may be more appropriate for ground transportation, says Dr. Herbert Lander, technical area manager, aviation fuel development, U.S. Air Force.

Gasoline or jet fuel refined from crude or shale oil has an energy density twice that of methanol: You can go twice as far on one gallon of gasoline as on one gallon of methanol. Military aircraft, says Dr. Lander, would be the most likely users of shale oil; then they wouldn't have to stop to refuel so much.

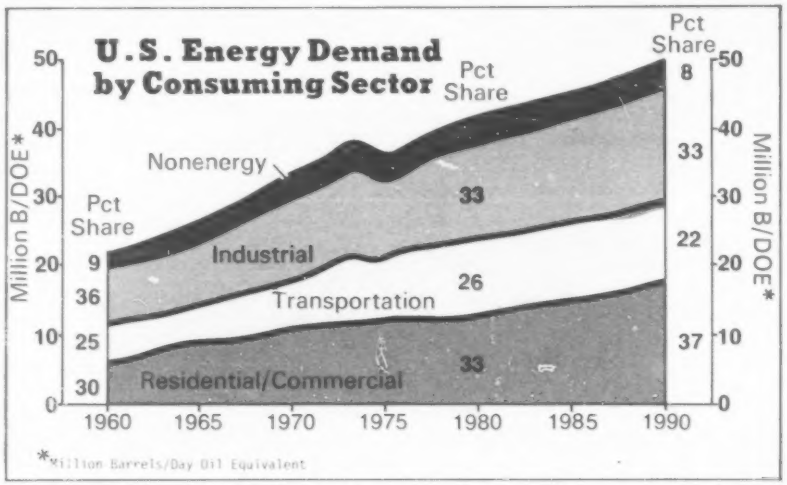
"On the ground, however," says Dr. Lander, "you can have larger fuel tanks than in aircraft. There are many fuel stations in most parts of the country, so range isn't so critical. Guarantee a range of 300 to 400 miles, and civilian or military ground vehicles can use methanol.

"Methanol is the best illustration of the need for partnership between chemical and automotive engineering," says Mr. David of Exxon. "With an octane rating of 110, methanol might allow jacked-up compression ratios that, in a lean-burn engine, could bring efficiencies a third higher than conventional gasoline engines—and with fewer emission problems.

"Moreover, in a direct-injection, stratified-charge (DISC) engine, engineers might be able to boost this efficiency by at least another third."

Ford, Volkswagen, Daimler-Benz, and MAN of Germany are working on methanol DISC engines.

Disassociation of methanol into hydrogen and carbon monoxide also could boost the fuel's efficiency by 15 to 20




pct. Ford and Conoco engineers are developing a catalytic chamber that will use exhaust heat from the engine to disassociate methanol coming from the fuel tank. The hydrogen and carbon monoxide then would be fed into the engine.

"We don't think it's possible to have a catalyst large enough," says Thomas J. Feaheny, vice president, vehicle research, Ford Motor Co., "to run the vehicle this way all the time. When you accelerate hard, you'd probably use liquid methanol.

"But for lightly loaded cruising, you might be able to use these hydrogen and carbon monoxide gases and improve fuel economy.

"In the next two to three years we'll find out how feasible this is."

"We're pretty excited about this," says M. L. Sharrah, senior vice president, research and engineering, Conoco, Inc. General Motors and Volkswagen are considering similar research with Conoco.

So far, no automaker has produced an engine that makes full use of methanol's high efficiency. The oil industry, on the other hand, has not determined what the standard composition of methanol should be, says Mr. Feaheny.

Should the engine use nearly pure methanol, or should it use a blend? Experts disagree.

"Pure methanol is not a sensible fuel," says Mr. Feaheny. "You need additives for lubrication; and for cold-start. You need additives to give methanol color and odor.

"In its chemically pure state, methanol is colorless and virtually odorless, with a slightly sweet smell. If you washed with it, your hands would feel very clean. But methanol is poisonous and can cause blindness."

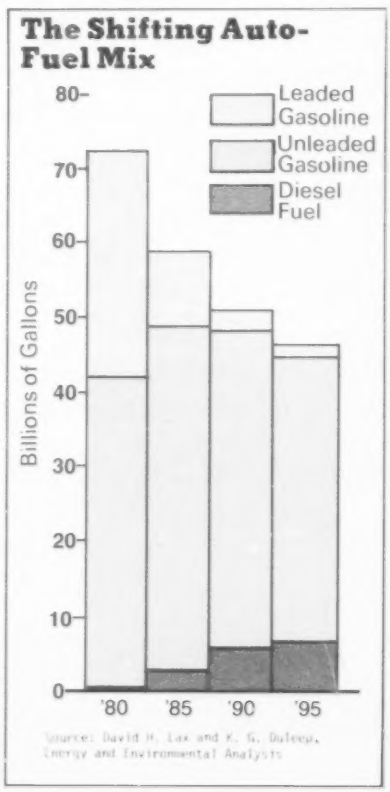
Cold start is methanol's top problem.

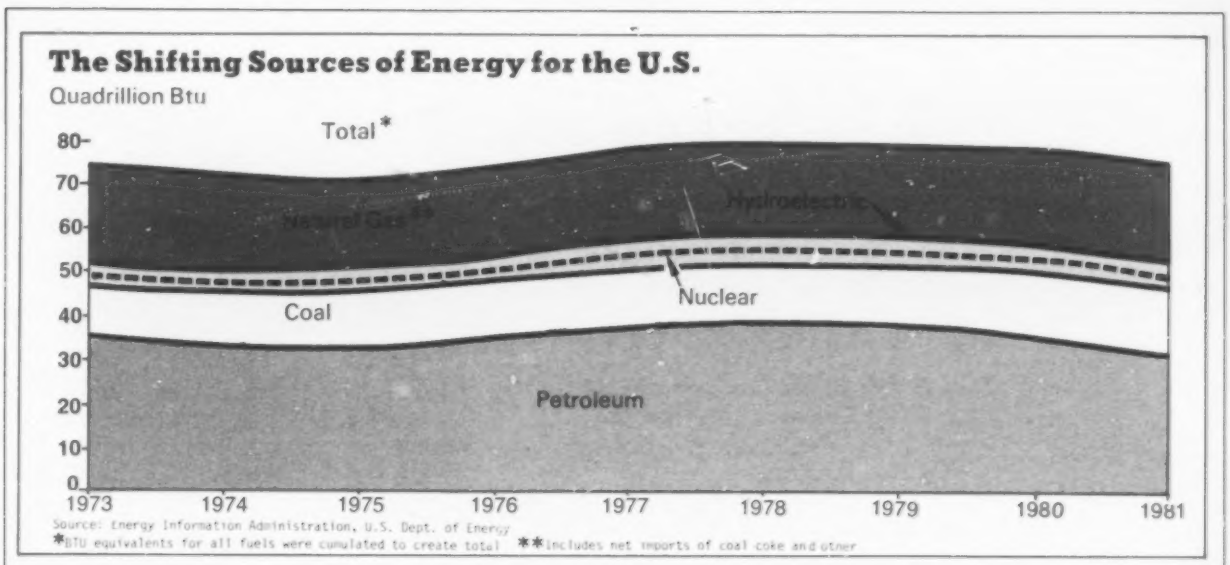
"An engine powered by methanol," says Nick E. Gallopoulos, General Motors Technical Center, "won't start at less than about 55°F. Methanol doesn't vaporize very readily. It's an engineering problem: You don't necessarily need new technology."

Among the solutions being studied by automakers, says Mr. Gallopoulos:

"1. You could have a small tank of gasoline or propane (liquefied natural gas) and a little squirter pump that will give you enough gasoline or propane to start the vehicle. Then you switch from that starting fluid to the methanol. In Brazil that's how they start their ethanol (grain alcohol) cars: Gasoline is the starting fluid.

(Cont. on p. 46)






(Cont. from p. 43)

"2. You use some kind of heater, perhaps electric, to vaporize the methanol.

"3. You blend some volatile material, probably a hydrocarbon, with the methanol, so you have a mixed fuel in the fuel tank. This enables you to start at lower temperatures. Of all the blends tried so far, however, none has been able to start in a Michigan winter.

"4. You use a heater plus the blend of the methanol with something more volatile."

Most fuel companies want to avoid blends that use a significant percentage of fuel besides methanol. They'd like to use just the miniscule amount of additives used in today's gasoline.

"The worst possible thing you could do," says Mr. Sharrah of Conoco, "is burn a fuel that had just 15 or 20 pct methanol, as some suggest. To do that, we'd have to convert our fuel system to produce enough methanol; and yet the car engines wouldn't get all the advantages of methanol's compression ratio.

"On the other hand, if you burned just 2 or 3 pct methanol, you could leave the engine as is. We should use either 2 or 3 pct methanol or nearly 100 pct methanol, not a blend of 15 pct methanol."

Officials of Los Angeles County and the California Energy Commission already are using a fleet of methanol Ford Escorts. The U.S. could phase in alternative fuels by introducing them first to fleets and selected regions of the country, most likely the West Coast.

Unlike gasoline, methanol has to be stored in tanks that never store other fuels. Methanol and other alcohol-based fuels absorb water, so they have to be kept completely dry.

The parts of the car that directly contact the methanol probably won't be made of uncoated steel.

"Methanol is a unique solvent that's corrosive," says Mr. Feaheny of Ford, "and dissolves some substances. It likes to dissolve rubber and polymers, fuel-tank linings, and trim plate. It attacks basically all metals: steel, zinc, and aluminum.

"The ultimate solution would be to use more plastic materials like nylon or polyethylene that are impervious to attack from methanol; or use more coatings of metal parts. A plastic fuel tank would be possible.

"Also, we are trying different metals: stainless steel in the fuel tanks and tubes; and nickel plating for the carburetors."

"People simply haven't concentrated on what alloys should be used," says Mr. Brown of Sohio, "for different engine components, for gaskets, and for throttle valves and plates.

"The methanol engine is really no different from a gasoline engine. It's not hard to make the conversion. Most car companies could produce a methanol-engine car within one year if they devoted their attention to it."

Fuel companies could build large-scale methanol plants within three to ten years, depending on how strictly the government enforced environmental regulations.

Crucial to the ability of the United States to build methanol plants quickly, says Mr. Gallopoulos, is "our capacity to produce the right kinds of steel and the right kinds of reaction vessels."

Both shale-oil and methanol plants would require huge, thick-walled vessels. That would mean big orders for steel, construction, and off-road-vehicle companies.

Other alternative fuels are compressed natural gas (CNG); liquefied natural gas (propane); and ethanol (grain alcohol).

"Natural gas," says Mr. Feaheny, "is free of the problems that alcohols have with corroding, being toxic, and attacking various seals and rubber polymer components of the car.

"The big issue with natural gas is high-volume production of pressure tanks to store the natural gas at 2500 to 3000 psi maximum. Probably these tanks will be aluminum cylinders wound with composite fiberglass or Kevlar or some other reinforcing composite material to build in hoop strength around the cylinder's diameter. Steel is much too heavy."

Experts disagree about how much natural gas the U.S. has. Deregulation of natural gas probably will eliminate any price advantage natural gas has over gasoline.

"Natural gas," says Ralph D. Fleming, office of vehicle and engine r&d, Dept. of Energy, "logically can be used in home heating, stationary industrial applications, and some vehicle fleets, but not as a total transportation fuel."

One appeal of both compressed natural gas and electric vehicles: You can fuel your car at home. Using a small compressor, a car owner can pump CNG into his car for four hours and get a 200-mile range.

Electric vehicles still lack a powerful battery. GM is working on a zinc/nickel battery.

Ford already is selling cars and trucks powered by propane. GM has no similar plans.

"Propane," says Mr. Feaheny, "is a by-product from the production of crude oil and natural gas. It will never play a major role; there's not enough available."

Ethanol, on the other hand, already is powering many cars in South America: 60 pct of the cars currently produced in Brazil use pure ethanol.



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Ethanol is made from different plants, or biomass. In Brazil, ethanol is made from sugar cane. In the U.S., ethanol made from corn is subsidized but not commercially competitive.

"If we could make ethanol cheaply," says Mr. Gallopoulos of GM, "from such low-value plants as corn stalks or scrawny trees, ethanol might be competitive in the U. S. Genetic engineers are researching that.

"In some parts of the world a cheaper biomass is available. Ethanol has a good future there but not in the U.S."

Besides Brazil, South Africa and New Zealand have active programs to develop alternative fuels. New Zealand imports 100 pct of its energy but has large local deposits of natural gas. Now the country is pursuing projects both to compress the natural gas and to convert it to methanol or gasoline. South Africa soon will begin operating its full-scale Westinghouse coal gasifier.

Mexico, Argentina, Germany, Sweden, Thailand, and Japan are actively studying alternative fuels. Saudi Arabia and Japan recently agreed to market 660,000 tons of methanol in Japan and elsewhere. Japan imports almost all its energy.

Brazil uses more alternative fuels than perhaps any other nation in the world. Should the U.S. government mandate the same sort of stiff energy requirements imposed by the Brazilian government? How can auto companies, fuel companies, and the government cooperate to increase the use of shale oil and methanol in the U.S.?

The public and private sectors did cooperate to phase in unleaded gasoline and diesel fuel. Government regulations drove unleaded fuel, reduced emissions, and increased fuel economy.

The approach might work again. The U.S. government could require fuel and auto companies to sell a certain percentage of methanol or shale-oil fuel and cars each year. Or it could give incentives such as tax relief for research and development and sales of alternative fuels across the board.

"I'd like to see the government guarantee the price of imported crude oil," says Mr. Feaheny. "As OPEC lowers its price, the government would raise the tax so that the price of oil would be kept constant. That way someone investing in alternative energy would know what price he'd be competing with when he delivered his product to the market.

If automakers knew the future price of gasoline, they would be able to build the right mix of big and small cars to meet market demand. Chrysler Chairman Lee A. Iacocca is proposing a 25¢/gallon tax on today's gasoline.

"We've got to get serious again about an energy policy," says Mr. Iacocca. "Slap a surtax on imported oil or an excise tax on gasoline at the pump, and send a message to the American consumer that the days of conservation are not over, big cars are not back to stay, and gas is not there to be guzzled again."

"Customers will not want efficient autos or synthetic fuels at any cost," says Mr. David of Exxon. "Auto and fuel companies will be competing hard for their dollars, with price a dominant concern."

"The private sector and the free marketplace," says Mr. Fleming of DOE, "have to determine which alternative fuels are best. The government shouldn't arbitrarily dictate to industry which quantities of which fuels are best.

"But there's one problem with leaving energy to the marketplace, history shows: You have to have another shortage before people get going on what needs to be done." □

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EFFECTIVE JUNE 13, 1983

# MATERIALS NEWSFRONT

## Important Notice About Iron Age Scrap Prices

Beginning with the Jan. 21 issue Iron Age has been publishing only one set of scrap prices per issue—those with the effective date as close to the issue date as printing schedules permit. Prices for other weeks are available on a weekly basis through our Metal Price Phone Hotline or through our Weekly Price Newsletter.

### Lake Superior Ore Prices

51.50% Fe Natural delivered lower Lake ports. Rail transportation, handling and unloading may be charged to the account of the buyer. Coarse ore 80¢ premium.

Pellets (per iron unit natural)..... gross-ton 80.50-86.9*
Old range, non-bessemer ..... gross-ton $32.78
Mesabi, regular-unscreened ..... gross-ton $32.53
Mesabi, non-bessemer.....gross-ton $32.25-32.53**

*80.50¢—Pickands Mather as of 1/27/81.
**86.9¢—U. S. Steel as of 3/15/82. Cleveland-Cliffs as of 2/26/82, Oglebay Norton as of 3/25/82, and Hanna Mining as of 2/26/82.

## Steel Production, Composite Prices

(Effective June 13, 1983)

| U.S. Steel Production | Last Week | Two Weeks Ago | To Date 1983 | To Date 1982 |
|---|---|---|---|---|
| Net tons, in thousands | 1,621 | 1,631 | 35,638 | 37,560 |
| Capability Utilization Rate | 56.1 | 56.4 | 53.2 | 55.0 |

| Composite Prices | This Week | Week Ago | Month Ago | Year Ago |
|---|---|---|---|---|
| Finished Steel Base* (¢/lb.—eff. 2/14/83) | 26.217 | 26.217 | 26.217 | 25.297 |
| Pig Iron** (Net ton = 2000 lbs.) | $213.00 | $213.00 | $213.00 | $213.00 |
| Scrap No. 1 hvy.*** (Gross ton = 2240 lbs.) | $ 70.83 | $ 70.83 | $ 67.50 | $ 61.83 |
| No. 2 bundles | $ 46.50 | $ 46.50 | $ 46.50 | $ 44.17 |

**Scrap Comparison** (Gross Ton)

| | | | | |
|---|---|---|---|---|
| No. 1 steel, Pittsburgh | $ 72.50 | $ 72.50 | 68.50 | $ 64.50 |
| No. 1 steel, Philadelphia | 68.50 | 68.50 | 66.50 | 64.50 |
| No. 1 steel, Chicago | 71.50 | 71.50 | 67.50 | 56.50 |
| No. 1 bundles, Detroit | 71.50 | 71.50 | 69.50 | 52.50 |
| Low Phos., Youngstown | 75.50 | 75.50 | 71.50 | 68.50 |
| No. 1 mach'y cast., Pgh | 74.50 | 74.50 | 74.50 | 79.50 |
| No. 1 mach'y cast., Phila | 98.50 | 98.50 | 98.50 | 103.50 |
| No. 1 mach'y cast., Chi | 108.50 | 108.50 | 108.50 | 109.50 |

*Finished Steel Composite
Weighted index of steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.
**Pig Iron Composite
Based on average prices for basic and foundry pig iron at representative producing points within the U.S.
***Steel Scrap Composite
Average of No. 1 hvy. melting steel scrap and No. 2 bundles delivered to consumers at Pittsburgh, Philadelphia and Chicago.

## Nonferrous Prices

(Effective June 13, 1983)
Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated.

### Primary Metal Prices

| (cents per lb.) | current price | last price | date of change |
|---|---|---|---|
| Aluminum | 76.00 (Nom.) | 76.00-80.00 | 1/4/82 |
| Copper (C) | 78.50-79.00 | 78.00-79.00 | 6/10/83 |
| Lead | 19.00-23.00 | 19.50-23.00 | 6/7/83 |
| Magnesium ingot | 138.00 | 134.00-138.00 | 6/1/83 |
| Nickel | 329.00 | 350.00 | 11/25/81 |
| Titanium Sponge | 555.00-585.00 | 555.00 | 4/29/82 |
| Zinc | 40.00 | 38.00-40.00 | 4/27/83 |

ALUMINUM: 99.5%. COPPER (C) = cathode. LEAD: common grade. MAGNESIUM: 99.8% pig, Velasco, Tex. NICKEL: electro., Port Colborne, Canada. ZINC: high grade.

Antimony, American Laredo, Texas . $2.00
Beryllium-aluminum 5% Be, per lb. contained Be ..... $215.00
Beryllium-copper, per lb. cont. Be $130.00
Beryllium 97% powder 200 ..... $166.00
Bismuth, ton lots ..... $1.55-$1.70
Cadmium, under one ton ..... $1.05-$1.15
Calcium, ton lots, crown ..... $3.05
Chromium, 99.8% ..... $3.75
Cobalt, 99%, cathode ..... $12.50
Gold per troy oz. ..... $413.00
Indium, dollars per troy oz. ..... $3.50
Iridium, dollars per troy oz. ..... $600
Magnesium sticks, 10,000 lbs. ..... $1.91
Mercury, per 76-lb. f.o.b. N.Y. ..$300-$310
Molybdenum, lb. tech. moly oxides, 20 lb. MO can ..... $5.85
Nickel oxide sinter at U.S. points of entry ..... $3.12
Palladium, per troy oz. ..... $140
Platinum, per troy oz. ..... $475
Rhodium, per troy oz. ..... $600.00
Silver ingots, per troy oz. ..... $11.625
Vanadium ..... $4.94
Zirconium sponge..... $12.00-$17.00
*(Per lb. unless otherwise noted)*

### Straits Tin Price

*(U.S. cents per lb, EX-SMELTER, based on daily market in Penang in Malaysian dollars per kilo.)*

June 6—596.72 June 9—597.68
June 7—597.17 June 10—598.29
June 8—596.84

## Scrap Prices

### Brass Mill Scrap

*(Cents per lb; over 20,000 lbs. add 1¢ per lb)*

| | Solids | Turning |
|---|---|---|
| Copper | 77⅛ | 68¼ |
| Yellow brass | 64½ | 61⅛ |
| Red brass | 70⅝ | 65⅝ |
| Comm. bronze | 72¾ | 67 |
| Mang. bronze | 64⅛ | 61¼ |
| Free cutting rod ends | 59 | 58 |

### Custom Smelters Scrap

*(Cents per lb., carload lots, del. refinery)*

| | |
|---|---|
| No. 1 copper wire | 69 |
| No. 2 copper wire | 61 |
| Light copper | 52 |

### Ingot Makers Scrap

*(Cents per lb., carload lots, del. refinery)*

| | |
|---|---|
| No. 1 copper wire | 65 |
| No. 2 copper wire | 57 |
| Light copper | 48 |
| No. 1 composition | 56 |
| No. 1 comp. turnings | 53 |
| Hvy. yellow brass solids | 37 |
| Hvy. yellow brass turnings | 29 |
| Radiators | 45 |

*Aluminum*

| | | |
|---|---|---|
| New mixed clips | 42 | —43 |
| Old sheet | 39 | —40 |
| Old cast | 39 | —40 |
| Clean dry borings | 39 | —40 |

### Dealers' Scrap

*(Dealers' buying price f.o.b. New York in cents per pound)*

**Aluminum**

| | | |
|---|---|---|
| Segregated clippings | 33 | —34 |
| Mixed L.C. clips | 28 | —29 |
| Old sheets and cast | 25 | —26 |
| Borings and turnings | 17 | —18 |
| Duraluminum clippings | 28 | —29 |

**Copper and Brass**

| | | |
|---|---|---|
| No. 1 copper wire | 61 | —62 |
| No. 2 copper wire | 54 | —55 |
| Light copper | 48 | —49 |
| Radiators | 38 | —39 |
| No. 1 composition | 48 | —49 |
| No. 1 composition turn'gs | 45 | —46 |
| Cocks and faucets | 34 | —35 |
| Clean heavy yellow brass | 32 | —33 |
| Brass Pipe | 33 | —34 |
| New soft brass clippings | 48 | —49 |

**Lead**

| | | |
|---|---|---|
| Heavy soft lead | 9 | —10 |
| Whole batteries | 3 | — 4 |
| Type metal | 15 | —16 |
| Electrotype | 14 | —15 |

**Nickel**

| | | |
|---|---|---|
| Nickel solids | 110 | —120 |
| Nickel rod ends | 110 | —120 |
| Nickel sheets, clips | 110 | —120 |
| Nickel turnings | 50 | — 60 |

**Zinc**

| | | |
|---|---|---|
| New zinc clippings | 15 | —16 |
| Old diecast zinc | 9 | —10 |

EFFECTIVE JUNE 13, 1983

# MATERIALS NEWSFRONT

(Effective June 13, 1983) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated. Prices are the opinions of *Iron Age* editors and correspondents, based on contacts with dealers, brokers, generators and users in the industry on the effective date listed above.

## Ferrous Scrap Prices

### Pittsburgh

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 72.00 to | $ 73.00 |
| No. 2 hvy. melting | 61.00 to | 62.00 |
| No. 1 dealer bundles | 87.00 to | 88.00 |
| No. 1 factory bundles (auto) | 87.00 to | 88.00 |
| No. 2 bundles | 51.00 to | 52.00 |
| No. 1 busheling | 86.00 to | 87.00 |
| Machine shop turn. | 7.00 to | 8.00 |
| Shoveling turnings | 26.00 to | 27.00 |
| Cast iron borings | 25.00 to | 26.00 |
| Low phos. punchings plate | 88.00 to | 89.00 |
| Heavy turnings | 61.00 to | 62.00 |
| No. 1 RR hvy. melting | 88.00 to | 89.00 |
| Rails 2 ft. and under | 103.00 to | 104.00 |
| Scrap rails, random lgth. | 88.00 to | 89.00 |
| RR specialties | 94.00 to | 95.00 |
| No. 1 machinery cast | 74.00 to | 75.00 |
| Cupola cast | 67.00 to | 68.00 |
| Heavy breakable cast | 30.00 to | 31.00 |
| Stainless | | |
| 18-8 bundles and solids | 590.00 to | 600.00 |
| 18-8 turnings | 490.00 to | 500.00 |

### Chicago

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 71.00 to | $ 72.00 |
| No. 2 hvy. melting | 64.00 to | 65.00 |
| No. 1 dealer bundles | 84.00 to | 85.00 |
| No. 1 factory bundles (auto) | 85.00 to | 86.00 |
| No. 2 dealer bundles | 44.00 to | 45.00 |
| No. 1 busheling | 82.00 to | 83.00 |
| Shredder scrap | 81.00 to | 82.00 |
| Machine shop turn. | 17.00 to | 18.00 |
| Mixed bor. and turn. | 18.00 to | 19.00 |
| Shoveling turnings | 24.00 to | 25.00 |
| Cast iron borings | 37.00 to | 38.00 |
| Low phos. forge crop | 89.00 to | 90.00 |
| Low phos. punchings plate ⅛ in. and heavier | 98.00 to | 99.00 |
| Low phos. 2 ft. and under | 93.00 to | 94.00 |
| No. 1 RR hvy. melting | 82.00 to | 83.00 |
| Scrap rails, random lgth. | 70.00 to | 71.00 |
| Reroller rails | 94.00 to | 95.00 |
| Rails, 2 ft. and under | 94.00 to | 95.00 |
| RR couplers and knuckles | 82.00 to | 83.00 |
| RR car axles | 112.00 to | 113.00 |
| No. 1 machinery cast | 108.00 to | 109.00 |
| Cupola cast | 95.00 to | 96.00 |
| Stove plate | 94.00 to | 95.00 |
| Steel car wheels | 82.00 to | 83.00 |
| Stainless | | |
| 18-8 bundles and solids | 560.00 to | 580.00 |
| 18-8 turnings | 450.00 to | 460.00 |
| 430 bundles and solids | 135.00 to | 140.00 |
| 430 turnings | 100.00 to | 105.00 |

### Philadelphia

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 67.00 to | $ 70.00 |
| No. 2 hvy. melting | 54.00 to | 57.00 |
| No. 1 dealer bundles | 80.00 to | 83.00 |
| No. 2 dealer bundles | 42.00 to | 45.00 |
| No. 1 busheling | 80.00 to | 83.00 |
| Shredder scrap | 79.00 to | 82.00 |
| Machine shop turn. | 23.00 to | 26.00 |
| Mixed bor. and turn. | 23.00 to | 26.00 |
| Shoveling turnings | 40.00 to | 43.00 |
| Low phos. 5 ft. and under | 79.00 to | 82.00 |
| Low phos. 2 ft. punchings | 89.00 to | 92.00 |
| Electric furnace bundles | 93.00 to | 96.00 |
| RR specialties | 81.00 to | 84.00 |
| Rails, 2 ft. and under | 92.00 to | 95.00 |
| Cupola cast | 58.00 to | 61.00 |
| Heavy breakable cast | 53.00 to | 56.00 |
| No. 1 machinery cast | 97.00 to | 100.00 |

### Detroit

Broker buying prices per gross ton on cars:

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 53.00 to | $ 54.00 |
| No. 2 hvy. melting | 51.00 to | 52.00 |
| No. 1 dealer bundles | 71.00 to | 72.00 |
| No. 2 bundles | 36.00 to | 37.00 |
| No. 1 busheling | 69.00 to | 70.00 |
| Drop forge flashings | 45.00 to | 46.00 |
| Machine shop turn. | 25.00 to | 26.00 |
| Mixed borings and turn. | 15.00 to | 16.00 |
| Shoveling turnings | 25.00 to | 26.00 |
| Cast iron borings | 15.00 to | 16.00 |
| Heavy breakable cast | 34.00 to | 35.00 |
| Mixed cupola cast | 50.00 to | 51.00 |
| Automobile cast | 73.00 to | 74.00 |
| Stainless | | |
| 18-8 bundles and solids | 470.00 to | 480.00 |
| 18-8 turnings | 350.00 to | 360.00 |
| 430 bundles and solids | 115.00 to | 125.00 |

### Youngstown

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 67.00 to | $ 70.00 |
| No. 2 hvy. melting | 46.00 to | 49.00 |
| No. 1 dealer bundles | 78.00 to | 81.00 |
| No. 2 dealer bundles | 37.00 to | 40.00 |
| Machine shop turn. | 1.00 to | 3.00 |
| Shoveling turnings | 5.00 to | 8.00 |
| Low phos. plate | 74.00 to | 77.00 |
| Electric furnace bundles | 71.00 to | 74.00 |
| Galvanized bundles | 61.00 to | 64.00 |

### Cleveland

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 60.00 to | $ 63.00 |
| No. 2 hvy. melting | 27.00 to | 30.00 |
| No. 1 dealer bundles | 76.00 to | 79.00 |
| No. 1 factory bundles | 74.00 to | 77.00 |
| No. 2 bundles | 22.00 to | 25.00 |
| No. 1 busheling | 76.00 to | 79.00 |
| Machine shop turn. | 1.00 to | 4.00 |
| Mixed bor. and turn. | 1.00 to | 4.00 |
| Shoveling turnings | 3.00 to | 6.00 |
| Cast iron borings | 6.00 to | 9.00 |
| Cut structural & plates, 2 ft. and under | 92.00 to | 95.00 |
| Low phos. punchings plate | 92.00 to | 95.00 |
| Drop forge flashings | 31.00 to | 34.00 |
| Foundry steel, 2 ft. & under | 57.00 to | 60.00 |
| No. 1 RR hvy melting | 61.00 to | 64.00 |
| Rails, 2 ft. and under | 97.00 to | 100.00 |
| Rails, 18 in. and under | 98.00 to | 101.00 |
| Steel axle turnings | 67.00 to | 70.00 |
| Railroad cast | 80.00 to | 83.00 |
| No. 1 machinery cast | 87.00 to | 90.00 |
| Cupola cast | 60.00 to | 63.00 |
| Stove plate | 45.00 to | 48.00 |
| Stainless | | |
| 18-8 bundles | 325.00 to | 335.00 |
| 18-8 turnings | 275.00 to | 285.00 |
| 430 bundles | 80.00 to | 85.00 |

### Buffalo

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 33.00 to | $ 34.00 |
| No. 2 hvy. melting | 23.00 to | 24.00 |
| No. 1 busheling | 38.00 to | 39.00 |
| No. 1 dealer bundles | 36.00 to | 38.00 |
| No. 2 bundles | 20.00 to | 21.00 |
| Machine shop turn. | 9.00 to | 10.00 |
| Mixed bor. and turn. | 16.00 to | 17.00 |
| Shoveling turnings | 17.00 to | 18.00 |
| Cast iron borings | 15.00 to | 16.00 |
| Low phos. plate | 56.00 to | 57.00 |
| Structural and plate, 2 ft. and under | 54.00 to | 55.00 |
| Rails, 2 ft. and under | 50.00 to | 51.00 |
| Scrap rails, random lgth. | 30.00 to | 31.00 |
| No. 1 machinery cast | 71.00 to | 72.00 |
| No. 1 cupola cast | 48.00 to | 49.00 |

### St. Louis

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 63.00 to | $ 64.00 |
| No. 2 hvy. melting | 52.00 to | 53.00 |
| Foundry steel, 2 ft. | 52.00 to | 53.00 |
| No. 1 dealer bundles | 63.00 to | 64.00 |
| No. 2 bundles | 49.00 to | 50.00 |
| Machine shop turn. | 12.00 to | 13.00 |
| Shoveling turnings | 18.00 to | 19.00 |
| Cast iron borings | 30.00 to | 31.00 |
| No. 1 RR hvy. melting | 63.00 to | 64.00 |
| Rails, random length | 69.00 to | 70.00 |
| Rails, 18 in. and under | 84.00 to | 85.00 |
| RR specialties | 80.00 to | 81.00 |
| Cupola cast | 70.00 to | 71.00 |
| Heavy breakable cast | 48.00 to | 49.00 |
| Stove plate | 75.00 to | 76.00 |
| Cast iron car wheels | 49.00 to | 50.00 |
| Rerolling rails | 96.00 to | 97.00 |
| Unstripped motor blocks | 55.00 to | 56.00 |

### Birmingham

| | | |
|---|---|---|
| No. 1 heavy melting | $ 64.00 to | $ 65.00 |
| No. 2 heavy melting | 59.00 to | 60.00 |
| No. 1 dealer bundles | 64.00 to | 65.00 |
| No. 2 bundles | 45.00 to | 46.00 |
| No. 1 busheling | 63.00 to | 64.00 |
| Shredder scrap | 77.00 to | 78.00 |
| Machine shop. turn. | 24.00 to | 25.00 |
| Shoveling turnings | 35.00 to | 36.00 |
| Cast iron borings | 35.00 to | 36.00 |
| Electric furnace bundles | 62.00 to | 63.00 |
| Elec. furnace, 3 ft. & under | 59.00 to | 60.00 |
| Structural and plate, 2 ft. | 80.00 to | 81.00 |
| Structural and plate, 4 ft. | 77.00 to | 78.00 |
| No. 1 RR hvy. melting | 63.00 to | 64.00 |
| Scrap rails, random lgth. | 68.00 to | 69.00 |
| Rails, 18 in. and under | 84.00 to | 85.00 |
| Angles and splice bars | 76.00 to | 77.00 |
| No. 1 cupola cast | 84.00 to | 85.00 |
| Unstripped motor blocks | 59.00 to | 60.00 |

### Cincinnati

Brokers buying prices per gross ton on cars:

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 52.00 to | $ 53.00 |
| No. 2 hvy. melting | 50.00 to | 51.00 |
| No. 1 dealer bundles | 57.00 to | 58.00 |
| No. 2 bundles | 27.00 to | 28.00 |
| Machine shop turn. | 6.00 to | 7.00 |
| Shoveling turnings | 8.00 to | 9.00 |
| Cast iron borings | 11.00 to | 12.00 |
| Low phos. 18 in. and under | 75.00 to | 76.00 |
| Rails, random length | 60.00 to | 61.00 |
| Rails, 2 ft. and under | 80.00 to | 81.00 |
| No. 1 cupola cast | 60.00 to | 61.00 |
| Heavy breakable cast | 25.00 to | 26.00 |
| Drop broken cast | 69.00 to | 70.00 |

### New York

Brokers buying prices per gross ton on cars:

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 34.00 to | $ 35.00 |
| No. 2 hvy. melting | 30.00 to | 32.00 |
| No. 2 dealer bundles | 22.00 to | 23.00 |
| Mixed bor. and turn. | 7.00 to | 8.00 |
| Machine shop turn. | 4.00 to | 5.00 |
| Shoveling turnings | 10.00 to | 12.00 |
| Clean cast. chem. borings | 34.00 to | 35.00 |
| No. 1 machinery cast | 89.00 to | 90.00 |
| Mixed yard cast | 38.00 to | 39.00 |
| Heavy breakable cast | 14.00 to | 15.00 |
| Stainless | | |
| 18-8 prepared solids | 480.00 to | 500.00 |
| 18-8 turnings | 380.00 to | 400.00 |
| 430 prepared solids | 70.00 to | 80.00 |
| 410 solids | 60.00 to | 70.00 |

### Boston

Brokers buying prices per gross ton on cars:

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 38.00 to | $ 40.00 |
| No. 2 hvy. melting | 28.00 to | 30.00 |
| No. 1 dealer bundles | 44.00 to | 46.00 |
| No. 2 bundles | 29.00 to | 31.00 |
| No. 1 busheling | 44.00 to | 46.00 |
| Shredder scrap | 43.00 to | 45.00 |
| Machine shop turn. | 3.00 to | 5.00 |
| Shoveling turnings | 7.00 to | 9.00 |
| No. 1 machinery cast | 100.00 to | 105.00 |
| Mixed cupola cast | 28.00 to | 30.00 |
| Heavy breakable cast | 8.00 to | 10.00 |

### San Francisco

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 42.00 to | $ 44.00 |
| No. 2 hvy. melting | 34.00 to | 36.00 |
| No. 1 dealer bundles | 29.00 to | 31.00 |
| No. 2 dealer bundles | 13.00 to | 15.00 |
| Machine shop turn. | 6.00 to | 8.00 |
| Cast iron borings | 6.00 to | 8.00 |
| No. 1 cupola cast | 85.00 to | 87.00 |

### Los Angeles

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 41.00 to | $ 43.00 |
| No. 2 hvy. melting | 30.00 to | 32.00 |
| No. 1 dealer bundles | 28.00 to | 30.00 |
| No. 2 dealer bundles | 10.00 to | 12.00 |
| Machine shop turn. | 6.00 to | 8.00 |
| Shoveling turnings | 10.00 to | 12.00 |
| Cast iron borings | 6.00 to | 8.00 |
| Elec. furnace, 1 ft. and under (foundry) | 86.00 to | 88.00 |
| No. 1 cupola cast | 88.00 to | 90.00 |

### Seattle

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 59.00 to | $ 61.00 |
| No. 2 hvy. melting | 48.00 to | 50.00 |
| No. 2 bundles | 38.00 to | 40.00 |
| No. 1 cupola cast | 94.00 to | 96.00 |
| Mixed yard cast | 81.00 to | 83.00 |

### Hamilton, Ont.

Brokers buying price per net ton on cars:

| | |
|---|---|
| No. 1 heavy melting | $ 55.00 |
| No. 2 heavy melting cut 2 ft. and under | 52.00 |
| No. 1 dealer bundles | 60.00 |
| No. 2 bundles | 30.00 |
| Mixed steel scrap | 34.00 |
| Bush. new fact. prep'd. | 58.00 |
| Bush. new fact. unprp'd. | 50.00 |
| Machine shop turn. | 25.00 |
| Short steel turn. | 28.00 |
| Mixed bor. and turn. | 15.00 |
| Cast scrap | 48.00 |

### Houston

Brokers buying prices per gross ton on cars:

| | | |
|---|---|---|
| No. 1 hvy. melting | $ 67.00 to | $ 68.00 |
| No. 2 hvy. melting | 51.00 to | 53.00 |
| No. 2 bundles | 34.00 to | 36.00 |
| Machine shop turn. | 19.00 to | 20.00 |
| Crushed turnings | 35.00 to | 37.00 |
| Shredder scrap | 67.00 to | 68.00 |
| Cut structural plate 2 ft. and under | 84.00 to | 86.00 |
| Unstripped motor blocks | 58.00 to | 60.00 |
| Cupola cast | 71.00 to | 73.00 |

# METALWORKING PRICE TRENDS

## Prices go from falling to slight firmness

Producers' price tags in May showed just the slightest signs of firming a bit.

After two months of actual falling prices for producer finished goods, tags in May rose by 0.3 pct. May prices thus rose at an annual rate of 3.6 pct. Over the year, through May, prices of finished goods rose at only a 2.3 pct rate.

No real price turnaround is signaled. Simply, the price declines in March and April could not be expected to continue in the face of rising business activity. "No zooming price takeoff is foreseen," notes one price analyst.

Prices for metalworking product lines in May behaved in about the same way as did overall producer finished goods prices. The 22 metalworking product lines listed on the table here rose by a scant 0.2 pct average.

Overall finished goods prices in May were pushed up by good-sized jumps in some energy prices, which rose by 2.2 pct. That hike hit with a special impact in May, because it followed five straight months of declines in energy prices.

The energy price push came from home heating oil and gasoline prices, which were up 6.4 and 2.3 pct, respectively.

Natural gas prices continued to give ground in May, but not at the faster rates of previous months.

Prices of capital equipment rose by 0.2 pct in May. That rise followed a decline of 0.3 pct in April. The upturn is attributed to increases in some capital goods lines that showed declines in April. These included railroad equipment, machine tools and mining machinery.

Some capital goods lines that continued April prices through May included aircraft, generators and some instrument lines. Actual price declines in May were seen for heavy motor trucks and transformers.

Despite some signs of price firming in May, the overall producer finished goods price index showed a decline of 2.2 pct over the first five months of the year. In all of last year, this index rose by 3.7 pct.

A number of forecasts of producer prices for this year as a whole run between 1 pct and 2.5 pct. In the face of an overall price decline over the first five months of the year, these predictions point to definitely firming prices as the year goes on.

Even firmer prices through the year will mean moderate price increases as measured against recent years.

Latest Month Covered: May, 1983

| Products | Index Reading For Month (1967 = 100) | Pct Change From Previous Month | Pct Change From Year-Ago Month |
|---|---|---|---|
| Metal Cutting Machine Tools | 378.8 | + 0.9 | + 2.8 |
| Metal Forming Machine Tools | 415.3 | + 0.1 | + 3.9 |
| Agricultural Machinery & Equip. | 326.0 | + 0.4 | + 5.8 |
| Construction Machinery & Equip. | 352.2 | + 0.4 | + 2.5 |
| Industrial Process Furnace & Ovens | 360.1 | − 0.3 | + 2.2 |
| Industrial Material Handling Equip. | 284.8 | 0 | − 1.0 |
| Pumps, Compressors & Allied Equip. | 347.4 | − 0.1 | − 0.4 |
| Fluid Power Equip. (Dec. 1970 = 100) | 252.1 | + 0.3 | + 3.7 |
| Mechanical Power Transmission Equip. | 315.4 | + 0.2 | + 1.0 |
| Automobiles | 217.3 | + 0.4 | + 2.9 |
| Motor Trucks—Light | 270.2 | 0 | + 2.5 |
| Motor Trucks—Heavy | 312.9 | − 1.5 | + 3.6 |
| Railroad Equipment | 357.1 | 0 | + 4.2 |
| Fabricated Metal Structural Products | 302.1 | − 0.2 | − 0.9 |
| Electric Motors | 304.1 | + 0.3 | + 3.8 |
| Valves (Metal, Ex-Fluid Power—Dec. 1982=100) | 100.7 | + 0.4 | NA |
| Ball & Roller Bearings | 331.2 | 0 | − 0.8 |
| Cutting Tools & Accessories | 275.6 | + 0.3 | + 1.3 |
| Heating Equipment | 242.4 | 0 | + 2.2 |
| Plumbing Fixtures & Brass Fittings | 288.8 | + 0.5 | + 2.8 |
| Metal Containers | 337.4 | + 1.6 | + 2.2 |
| Miscellaneous Metal Products | 284.9 | − 0.1 | + 0.1 |

Data based on U.S. Labor Dept.'s Producer Price Index